REMARKS

The Applicants would like to thank the Examiner for carefully reviewing the specification, drawings and claims. The Applicants respectfully request reconsideration of the application in view of the above amendments and the following remarks, which are directed to each of the ground for rejection of objection cited in the Office Action of March 12, 2004.

1. Amendments to the Specification, Drawings and Claim

a. Drawings

The drawings were objected to for failing to show each and every element of the claimed invention. Specifically, a system as recited in claims 29-46 were not shown in any drawing. The Applicants have canceled claims 29-46, and no newly presented claim recites any form of system. The Applicants therefore believe that the drawings in the application are consistent with the claims and meet the requirements of 37 CFR § 1.84.

Applicant also notes that Figure 7 has been amended for clarity.

b. Abstract

The Abstract was objected to as not being in the correct form. The Applicants have replaced the Abstract with a new one, which they believe is in the correct form.

c. Claims

Claims 1, 29, and 47 were objected to for reciting "ray bending correction." Claims 8, 14, and 17 were objected to for punctuation errors. Claim 47 was objected to for lacking a transition between the preamble and the body of the claim. Claims 1-47 were canceled in this Reply. No newly presented claim includes the errors called to the Applicants' attention by the Examiner and thus the Applicants believe that the objections to the claims are moot.

d. Specification

The specification has been amended in a number of places to correct typographical errors, and to clarify the description of how to make and use the claimed invention. The Applicant believes that each of the corrections would be facially apparent to a person of ordinary skill in the art, and that no new matter has been added by reason of the amendments to the Specification. Amendments to the equations, for example are not believed to be new matter because the variables represented by the equations and the calculations being performed on such variables are well explained in the text, such that a person of ordinary skill in the art would readily be able to determine that the original versions of the equations merely included typographic errors. Amendments to the text of the Specification are generally in the manner of more precisely describing the process contemplated by the Applicants' invention, namely that prestack time migration is performed such that amplitudes are preserved, rather than maintained as any form of "true" amplitude. The proposed amendments do not in any way change the degree to which the Applicants' Specification enables a person of ordinary skill in the art to make or use the claimed invention. No change in the elements of the Applicants' method or in the scope thereof has been made by way of the proposed amendments. The Applicants therefore believe that no new matter would be added by reason of the amendments, and respectfully request their entry into the present application.

The Applicant also respectfully notes the following changes made by reason of the replacement equations noted above. The Applicant respectfully requests that the Examiner waive the requirement of 37 CFR 1.121 (b)(1)(ii) with respect to the above replacement equation because of the impracticability of showing deletions and insertions in the equation using available text editors.

a. Changes from the original version of equation (12) are: (a) the term $c_4 x_6^r$ in the left hand bracketed expression was changed to $c_4 x_r^6$ and; (b) the T terms in the denominators of both left hand and right hand bracketed expressions were raised to the second power.

b. Changes to equation (20) are: (a) the subscript was removed from the time term T on the left hand side of equation (20).

c. Changes from the original version of equation (21) are: (a) removal of the subscript from the first use of T on the left hand term of the equation; and (b) substitution of T_0^2 for T_r^2 in each of the square root expressions.

d. Changes from the original version of the second equation on page 20 of the Specification are: (a) T_r was changed to T in two parts of the equation; (b) reassigned v_s to the denominator; and (c) renamed V to V_r.

2. Patentability of the Claims

Claim Rejections – 35 U.S.C. § 102(b)

Claims 1-47 were rejected as anticipated by Barney (U.S. Patent No. 4,967,401). To the extent the rejection may apply to the new claims in the application, the Applicants respectfully traverse for the reasons which follow. Barney generally discloses a method for locating hydrocarbons or other geologic anomalies using seismic data. In the method disclosed in Barney, seismic data are processed to determine lithologic parameters, such as Poisson's ratio, density, and seismic velocity. The parameters are determined by relating amplitude of reflected seismic energy to the offset (source to receiver distance) for each of a plurality of seismic traces. A representative embodiment of the method of Barney is shown in Fig. 11 a and 11b of Barney. Seismic data re acquired and/or sorted into common mid point gathers. A reflectivity series is then determined form the common mid point trace gathered data. The reflectivity series is then used to determine Poisson's ratio, density and velocity for each gather to form a time series of Poisson's ratio, density and velocity. The values of reflectivity are checked for variation with respect to offset, so that variations in values with respect to offset which are anomalous may be indicative of permeable and/or hydrocarbon bearing formations.

The Applicants' invention of claim 48, by contrast, is related to methods for migrating seismic data. A method according to the Applicants' invention includes selecting an image point in the subsurface and generating an initial model of seismic velocity with respect to time. The disclosure in Barney is not related to and does not disclose imaging at any one or more points in the subsurface, rather, the Barney disclosure only includes processing data recordings corresponding to a common mid point between the seismic energy source and the

receiver at the time of acquisition. Further, Barney does not disclose or suggest generating an initial model of the formations. Rather, Barney uses reflection times and amplitudes to generate a reflection coefficient series, from which the relative layering of the formations is derived. In the Applicants' invention, the initial model includes substantially horizontal layers, each having a selected velocity and a selected thickness. Therefore, at least two affirmative limitations of claim 48 are not shown in Barney.

In the Applicants' invention of claim 48, moreover, a two-way travel time of seismic energy is determined from at least one seismic energy source position to at least one seismic receiver position, wherein the seismic energy is reflected from the image point. A ray path is determined from the at least one seismic source position to the image point and from the image point to the at least one seismic receiver position. The ray path is based on the source position, the receiver position and the velocity model. Determining a ray path from the source to the image point and back to the receiver is neither disclosed not suggested in Barney. Barney does disclose that simplified assumptions about seismic energy travel path such as are used to make normal moveout corrections for various offsets are not the true travel path of seismic energy, which is ordinarily refracted as it travels through layers of different velocities. However, Barney expressly states than an advantage of his invention is the ability to obtain amplitude parameters for seismic data without the need to expressly determine or estimate angle of incidence (which would necessitate having to calculate or determine a true ray path). See Barney col. 9, lines 58-60. Accordingly, another element of Applicants' claim 48 is not disclosed in Barney. Finally, Barney does not disclose determining a travel time from the ray path derived travel time, as recited in Applicants' claim 48. The Applicant respectfully notes that the cited portion of Barney is not meant to be an argument that Barney "teaches away" from the Applicants' invention of claim 48, but, rather, that Barney discloses a method which expressly does not use an element that is specifically recited in the Applicants' claimed process. It is the very essence of the Barney disclosure is that angle of incidence calculations are not performed, whereas in the Applicant's invention, ray path-corrected travel times are determined, in one embodiment, by a sixth order equation relating travel time to offset.

The disclosure in Barney is not related to methods for imaging or migration of seismic data, as is the Applicants' invention. Process steps disclosed in Barney that may appear

similar are not at all the same as the elements of the Applicants' claimed process are not related because the two processes are for very different uses of seismic data.

Accordingly, the Applicants' new claim 48 is neither disclosed nor implied by Barney. New claims 49-59 ultimately depend from claim 48 and are patentable over the art of record for at least the same reasons advanced with respect to claim 48.

The Applicants believe that this Reply is fully responsive to each and every ground of rejection and objection cited in the Office Action of March 12, 2004, and respectfully request early favorable action on their application.

Respectfully submitted,

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Annotated Marked-up Drawing

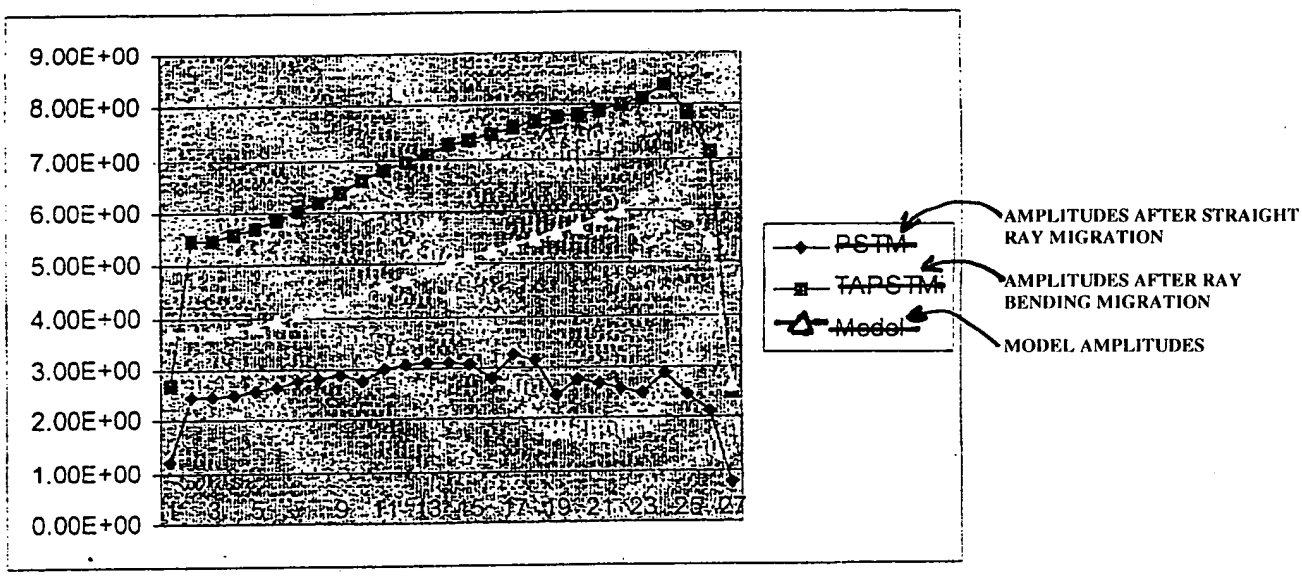

Fig. 7.